SNO Online Monitoring

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Software DAQ monitoring tools (CM_BRST, CM_CHTF) have been developed to optimize the on-line monitoring of "unusual occurrence" events in the SNO data stream. The SNO detector is very sensitive to any direct or scattered light that emerges inside the detector, whether it is physics related (such as Cherenkov light generated by particles) or due to instrumentation mishaps (e.g., rare micro-discharge events with light emission). It is important to tag these events promptly as they could mimic real physical bursts of interest, such as supernovae neutrinos. The tools we developed also attempt to "pre-detect" tube failure modes - to evaluate the chance for an imminent break-down of a channel based on its latest hit history. Automatic safety procedures (HV reduction, for instance) will then be used to prevent that from actually happening.

Each tool has four basic elements, (1) a fast event-by-event feature extraction processor, (2) an embedded evaluation algorithm and statis-tics accumulator, (3) an automatic registration and/or broadcasting link, and (4) an optimized visual representation of these questionable events to the operator or experimenter. Known abnormal behaviors of the tubes or electronics channels are identified and each coded with a weighting factor in the evaluation algorithm. This quantity is then checked against the "frequency" of occurrence to determine whether unusual conditions are met and that corrective actions are deemed necessary. The "unusual-tag" for these tubes will reset automatically when their behavior returns normal. Fig.1 shows a visual burst monitor module (CM_BRST) whose feature extraction is based on the light-path method (i.e., an event- plot of the relative tube distance versus time should show characteristic straight line patterns for real light). Any events induced by electronics breakdown and/or electrical pickup will deviate from these paths.

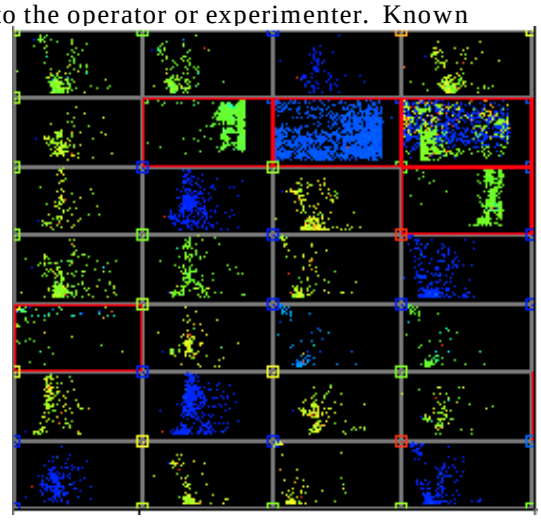

Fig.1 CM_BRST showing both normal and unusual occurrence tubes.

All the tools are implemented in the SNODAQ object-oriented software platform. The embedded algorithm for these modules is expected to need fine-tuning in detector operation. The development of neural-network based algorithms for these tools are in progress.

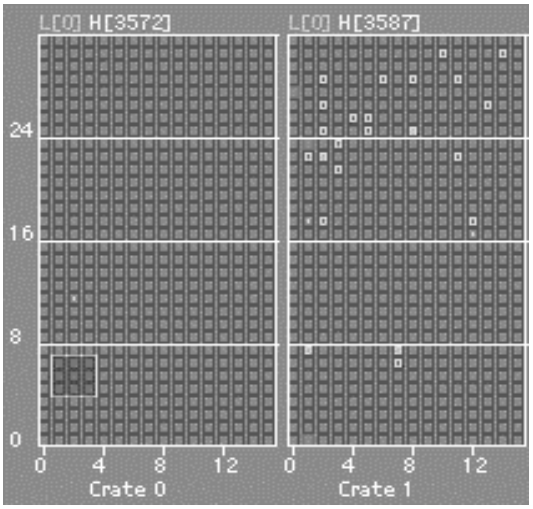

Fig.2 Portion of the consecutive hit module (CM_CHTF) showing a questionable tube in crate 0 which had fired consecutively in all of the previous 30 events.